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Colfax County, New Mexico

National Eutrophication Survey, Las Vegas, Nev.

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NATIONAL EUTROPHICATION SURVEY

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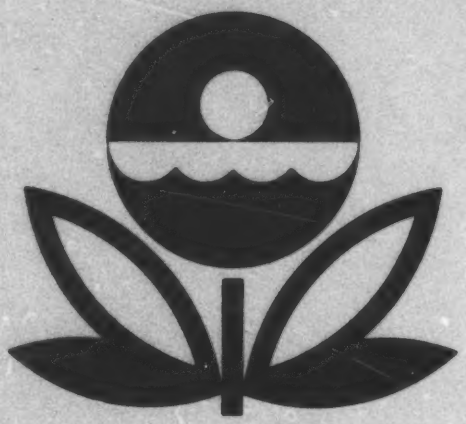

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

EAGLE NEST LAKE

COLFAX COUNTY

NEW MEXICO

EPA REGION VI

WORKING PAPER No. 820

WITH THE COOPERATION OF THE

NEW MEXICO ENVIRONMENTAL IMPROVEMENT AGENCY

AND THE

NEW MEXICO NATIONAL GUARD

JULY, 1977

REPORT ON EAGLE NEST LAKE

COLFAX COUNTY, NEW MEXICO

EPA REGION VI

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 820

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

July 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

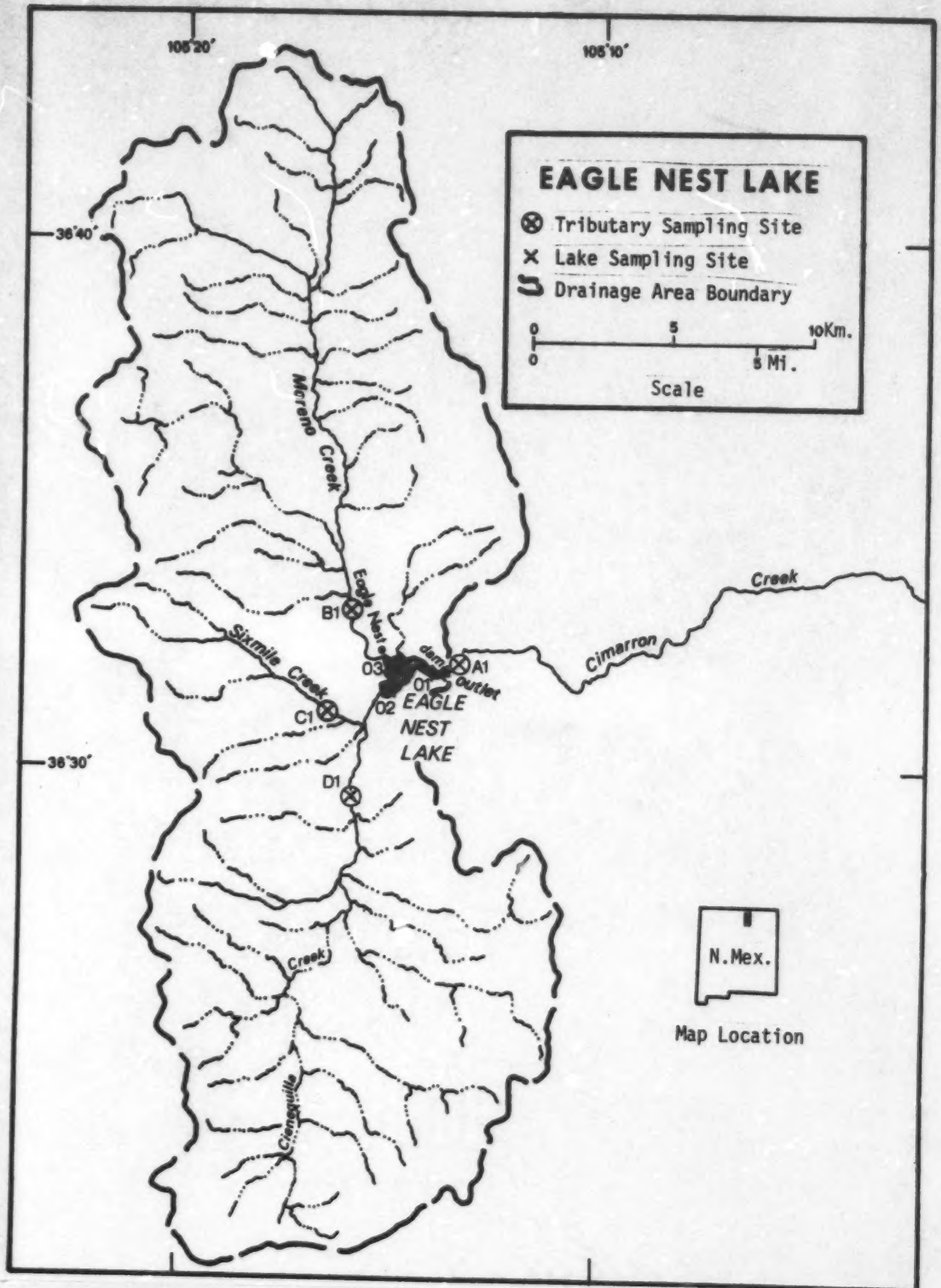
The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the New Mexico Environmental Improvement Agency for professional involvement, to the New Mexico National Guard for conducting the tributary sampling phase of the Survey, and to those New Mexico wastewater treatment plant operators who provided effluent samples and flow data.

The staff of the Surveillance Section, Water Quality Division, New Mexico Environmental Improvement Agency provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

Brigadier General Franklin E. Miles, the Adjutant General of New Mexico, and Project Officer Colonel Marvin D. Bohannon, who directed the volunteer efforts of the New Mexico National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY
STUDY LAKES
STATE OF NEW MEXICO

LAKE NAME	COUNTY
Alamogordo Reservoir (Sumner Lake)	De Baca, Guadalupe
Bluewater Lake	Valencia, McKinley
Conchas Reservoir	San Miguel
Eagle Nest Lake	Colfax
Elephant Butte Reservoir	Sierra
El Vado Reservoir	Rio Arriba
Lake McMillan	Eddy
Ute Reservoir	Quay


105°20'
105°10'
36°40'
36°30'
EAGLE NEST LAKE
Tributary Sampling Site
Lake Sampling Site
Drainage Area Boundary
0
5
10Km.
0
5 Mi.
Scale
Moreno Creek
Eagle Nest
dam
outlet
A1
B1
03
01
02
EAGLE NEST LAKE
Sixmile Creek
C1
D1
Cimarron Creek
Creek
Clemenville
N.Mex.
Map Location

REPORT ON EAGLE NEST LAKE, NEW MEXICO

STORET NO. 3504

I. CONCLUSIONS

A. Trophic Condition:*

Based on Survey data and field observations, Eagle Nest Lake is considered eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of the lake.

Chlorophyll a values in the lake ranged from 2.2 µg/l in August to 37.4 µg/l in October with a mean of 13.4 µg/l. Secchi disc visibility was low and the potential for primary productivity as measured by algal assay control yields was high. Of the nine New Mexico lakes (including Navajo Reservoir) sampled in 1975, none had higher median total phosphorus levels (0.181 mg/l), four had higher median inorganic nitrogen levels (0.070 mg/l), and none had higher median orthophosphorus values (0.132 mg/l) than Eagle Nest Lake.

Survey limnologists reported algal blooms on both the August and October sampling dates.

*See Appendix E.

B. Rate-Limiting Nutrient:

The algal assay results suggest that Eagle Nest Lake was limited by available nitrogen during both sample collection times (05/06/75, 10/07/75). The lake data further suggest primary limitation by nitrogen.

C. Nutrient Controllability:

1. Point sources -

There were no known point sources impacting Eagle Nest Lake during the sampling year. The present phosphorus loading of 0.27 g $P/m^2/yr$ is equal to that proposed by Vollenweider as "eutrophic" for a lake of such volume and retention time. Examination of land use practices may provide answers for reducing the nutrient input to the lake.

2. Nonpoint sources -

More.o Creek contributed 47.3% of the total phosphorus load to Eagle Nest Lake during the sampling year. Cieneguilla Creek contributed 25.9%, Sixmile Creek contributed 6.8% and minor tributaries and immediate drainage contributed an estimated 13.5%.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data were provided by Martin and Hanson (1966) and Tony Drypolcher (personal communication). Tributary flow data were provided by the New Mexico District Office of the U.S. Geological Survey (USGS). Outlet drainage area includes the lake surface area. Mean hydraulic retention time was obtained by dividing the lake volume by mean flow of the outlet. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 9.82 km^2.
2. Mean depth: 9.9 meters.
3. Maximum depth: 31.1 meters.
4. Volume: 97.954 x 10^6 m^3.
5. Mean hydraulic retention time: 1,922 days (5.3 yrs)

B. Tributary and Outlet:
(See Appendix B for flow data)

1. Tributaries -

Name	Drainage area (km^2)	Mean Flow (m^3/sec)
B-1 Moreno Creek	191.1	0.22
C-1 Sixmile Creek	27.2	0.07
D-1 Cieneguilla Creek	145.0	0.20
Minor tributaries and immediate drainage -	59.4	0.09
Total	422.7	0.58
2. Outlet - A-1 Cimarron Creek	432.5	0.59

C. Precipitation:

1. Year of sampling: 36.6 cm.
2. Mean annual: 33.2 cm.

III. LAKE WATER QUALITY SUMMARY

Eagle Nest Lake was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake (Station 03 was sampled only twice) and from one or more depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 12.5 meters at Station 01, the surface at Station 02, and 7.6 meters at Station 03. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(5/ 6/75) S*** = 2 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(8/21/75) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(10/ 7/75) S*** = 3 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	2	6.5- 6.9	6.7	0.0- 0.0	4	16.1- 17.8	17.2	0.0- 1.5	5	13.8- 14.8	14.5	0.0- 1.5
MAX DEPTH**	2	6.5- 6.6	6.5	0.0- 12.2	3	16.1- 16.4	16.2	0.0- 12.5	3	13.8- 14.5	14.2	0.0- 12.2
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	0	*****-*****	*****	*****-*****	5	3.0- 5.6	5.3	0.0- 1.5	5	6.4- 7.2	6.8	0.0- 1.5
MAX DEPTH**	0	*****-*****	*****	*****-*****	3	0.6- 3.9	3.0	0.0- 12.5	3	5.0- 6.8	6.2	0.0- 12.2
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	2	317.- 328.	323.	0.0- 0.0	5	275.- 277.	277.	0.0- 1.5	5	211.- 221.	219.	0.0- 1.5
MAX DEPTH**	2	317.- 329.	323.	0.0- 12.2	3	277.- 290.	277.	0.0- 12.5	3	211.- 221.	215.	0.0- 12.2
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	2	8.0- 8.2	8.1	0.0- 0.0	5	8.3- 8.7	8.6	0.0- 1.5	5	7.5- 8.3	8.2	0.0- 1.5
MAX DEPTH**	2	8.1- 8.2	8.1	0.0- 12.2	3	8.3- 8.5	8.4	0.0- 12.5	2	7.5- 8.3	7.9	0.0- 7.6
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	2	157.- 162.	160.	0.0- 0.0	5	133.- 139.	136.	0.0- 1.5	5	140.- 150.	149.	0.0- 1.5
MAX DEPTH**	2	157.- 160.	159.	0.0- 12.2	3	136.- 148.	139.	0.0- 12.5	3	140.- 150.	150.	0.0- 12.2
TOTAL P (MG/L)												
0.-1.5 M DEPTH	2	0.080-0.091	0.085	0.0- 0.0	5	0.151-0.268	0.162	0.0- 1.5	5	0.165-0.384	0.182	0.0- 1.5
MAX DEPTH**	2	0.091-0.092	0.091	0.0- 12.2	3	0.217-0.286	0.268	0.0- 12.5	3	0.160-0.477	0.384	0.0- 12.2
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	2	0.030-0.030	0.030	0.0- 0.0	5	0.111-0.181	0.125	0.0- 1.5	5	0.086-0.139	0.132	0.0- 1.5
MAX DEPTH**	2	0.030-0.030	0.030	0.0- 12.2	3	0.157-0.257	0.181	0.0- 12.5	3	0.086-0.137	0.132	0.0- 12.2
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	2	0.020-0.020	0.020	0.0- 0.0	5	0.020-0.020	0.020	0.0- 1.5	5	0.020-0.020	0.020	0.0- 1.5
MAX DEPTH**	2	0.020-0.020	0.020	0.0- 12.2	3	0.020-0.020	0.020	0.0- 12.5	3	0.020-0.020	0.020	0.0- 12.2
AMMONIA (MG/L)												
0.-1.5 M DEPTH	2	0.020-0.020	0.020	0.0- 0.0	5	0.040-0.160	0.060	0.0- 1.5	5	0.030-0.050	0.040	0.0- 1.5
MAX DEPTH**	2	0.020-0.020	0.020	0.0- 12.2	3	0.100-0.260	0.160	0.0- 12.5	3	0.040-0.060	0.050	0.0- 12.2
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	2	0.600-0.700	0.650	0.0- 0.0	5	0.300-0.500	0.400	0.0- 1.5	5	0.400-0.800	0.600	0.0- 1.5
MAX DEPTH**	2	0.500-0.700	0.600	0.0- 12.2	3	0.500-0.600	0.500	0.0- 12.5	3	0.400-1.200	0.800	0.0- 12.2
SECCHI DISC (METERS)	2	0.9- 1.0	0.9		3	0.4- 2.8	1.4		3	0.3- 1.3	0.9	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/06/75	1. Cryptomonas	3,042
	2. Chroomonas ?	1,703
	Other genera	--
	Total	4,745
08/21/75	1. Aphanizomenon	389
	2. Chroomonas ?	130
	3. Stephanodiscus	32
	4. Cryptomonas	32
	5. Schroederia	32
	Other genera	66
	Total	681
10/07/75	1. Aphanizomenon	3,639
	2. Chroomonas ?	1,178
	3. Oscillatoria	659
	4. Cryptomonas	173
	5. Schroederia	35
	Other genera	--
	Total	5,684

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/06/75	01	----
	02	15.8
	03	----
08/21/75	01	2.2
	02	5.9
	03	3.9
10/07/75	01	9.1
	02	37.4
	03	19.2

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum Yield (mg/l-dry wt.)
a. 05/06/75			
Control	0.040	0.040	2.0
0.05 P	0.090	0.040	2.4
0.05 P + 1.0 N	0.090	1.040	31.4
1.00 N	0.040	1.040	18.5
b. 10/07/75			
Control	0.118	0.159	14.0
0.05 P	0.168	0.159	14.1
0.05 P + 1.0 N	0.168	1.159	49.2
1.00 N	0.118	1.159	46.6

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary productivity in Eagle Nest Lake was high at both sample collection times (05/06/75, 10/07/75). In both assays, a significant increase in yield over that of the control occurred when nitrogen was added alone and in combination with phosphorus, indicating nitrogen limitation.

Spikes of phosphorus alone resulted in a yield which was not significantly greater than that of the control.

The mean inorganic nitrogen to orthophosphorus ratios (N/P) in the lake data were approximately 1/1 or less on all three sampling occasions further suggesting primary limitation by nitrogen (a mean N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the New Mexico National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May when two samples were collected. Sampling was begun in December 1974, and was completed in October 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New Mexico District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual nutrient loads, in kg/km^2/year, in Moreno Creek, Sixmile Creek and Cieneguilla Creek, at Stations B-1, C-1, and D-1 and multiplying the means by the ZZ area in km^2.

A. Waste Sources:

1. Known municipal - None
2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Moreno Creek	1,245	47.3
C-1 Sixmile Creek	180	6.8
D-1 Cieneguilla Creek	680	25.9
b. Minor tributaries and immediate drainage (nonpoint load) -	355	13.5
c. Known municipal STP's - None		
d. Septic tanks* -	<5	<0.1
e. Known industrial - None		
f. Direct precipitation** -	170	6.5
Total	2,630	100.0%
2. Outputs - A-1 Cimarron Creek	3,120	
3. Net annual P export*** -	490	

*Estimate based on 6 lakeshore residences.
**Estimated (See NES Working Paper No. 175).
***Export probably due to unknown sources and/or sampling error.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Moreno Creek	13,065	30.9
C-1 Sixmile Creek	2,980	7.1
D-1 Cieneguilla Creek	10,575	25.0
b. Minor tributaries and immediate drainage (nonpoint load) -	4,990	11.8
c. Known municipal STP's - None		
d. Septic tanks* -	65	0.1
e. Known industrial - None		
f. Direct precipitation** -	10,600	25.1
Total	42,275	100.0%
2. Outputs - A-1 Cimarron Creek	32,270	
3. Net annual N accumulation -	10,005	

*Estimate based on 6 lakeshore residences.
**Estimated (See NES Working Paper No. 175).

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Moreno Creek	6	68
Sixmile Creek	7	110
Cieneguilla Creek	5	73

E. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between eutrophic and oligotrophic.

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading (g/m^2/yr)
Estimated loading for Eagle Nest Lake	0.27
Vollenweider's "eutrophic" loading	0.27
Vollenweider's "oligotrophic" loading	0.14

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

19

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW MEXICO 12/16/76

LAKE CODE 3504 EAGLE NEST LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 432.5

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3504A1	432.5	0.054	0.261	0.311	0.708	1.416	0.963	0.878	1.076	0.453	0.481	0.229	0.170	0.586
3504B1	191.1	0.011	0.065	0.122	0.311	0.623	0.227	0.340	0.425	0.130	0.176	0.079	0.099	0.219
3504C1	27.2	0.017	0.091	0.045	0.093	0.122	0.167	0.096	0.099	0.068	0.045	0.028	0.020	0.074
3504D1	145.0	0.017	0.062	0.093	0.193	0.453	0.425	0.311	0.396	0.173	0.161	0.085	0.023	0.200
3504ZZ	69.2	0.008	0.042	0.051	0.113	0.227	0.156	0.139	0.173	0.071	0.076	0.037	0.027	0.094

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 432.5
SUM OF SUB-DRAINAGE AREAS = 432.5

TOTAL FLOW IN = 7.01
TOTAL FLOW OUT = 7.00

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3504A1	12	74	0.007	7	0.007				
	1	75	0.007						
	2	75	0.008	1	0.008				
	3	75	0.060	1	0.008				
	4	75	0.340	5	0.068	20	0.538		
	5	75	1.104	3	0.340	19	1.246		
	6	75	0.736	8	0.765				
	7	75	1.586	13	2.265				
	8	75	0.283	23	0.453				
	9	75	0.269	21	0.062				
	10	75	1.359	10	0.566	31	0.368		
	11	75	0.105						
3504B1	12	74	0.040	7	0.034				
	1	75	0.096	1	0.045				
	2	75	0.136	2	0.142				
	3	75	0.218	1	0.108				
	4	75	0.595	5	0.566	20	0.538		
	5	75	0.736	3	0.510	19	1.019		
	6	75	0.193	8	0.232				
	7	75	0.125	13	0.130				
	8	75	0.040	23	0.031				
	9	75	0.034	21	0.028				
	10	75	0.190	10	0.015	31	0.027		
	11	75	0.190						

ATTACHED FLOWAGE EASEMENT
D XHIBIT A

LAKE CODE 3504 EAGLE NEST LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3504C1	12	74	0.012	7	0.011				
	1	75	0.028	1	0.014				
	2	75	0.040	2	0.040				
	3	75	0.068	1	0.034				
	4	75	0.181	5	0.173	20	0.212		
	5	75	0.340	3	0.283	19	0.340		
	6	75	0.079	8	0.139				
	7	75	0.079	13	0.093				
	8	75	0.037	23	0.042				
	9	75	0.051	21	0.051				
	10	75	0.042	10	0.037	31	0.042		
	11	75	0.042						
3504D1	12	74	0.079	7	0.068				
	1	75	0.190	1	0.093				
	2	75	0.263	1	0.275				
	3	75	0.453	3	0.215				
	4	75	1.133	5	1.161	20	0.991		
	5	75	1.303	3	1.699	19	1.133		
	6	75	0.207	8	0.244				
	7	75	0.198	13	0.311				
	8	75	0.076	23	0.068				
	9	75	0.156	21	0.198				
	10	75	0.082	10	0.076	31	0.088		
	11	75	0.085						
3504Z7	12	74	0.011						
	1	75	0.074						
	2	75	0.088						
	3	75	0.091						
	4	75	0.215						
	5	75	0.269						
	6	75	0.133						
	7	75	0.051						
	8	75	0.017						
	9	75	0.130						
	10	75	0.108						
	11	75	0.108						

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350401
36 31 58.0 105 14 12.0 3
EAGLE NEST LAKE
35007 NEW MEXICO

101292

/TYPA/AMBNT/LAKE

11EPALES 04001002
0044 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/06	13 20	0000	6.9		38	328	8.00	162	0.020	0.600	0.020K	0.030
	13 20	0015	6.7									
	13 20	0040	6.6			329	8.10	160	0.020K	0.500	0.020K	0.030
75/08/21	09 15	0000	17.8	5.6	112	277	8.70	136	0.060	0.400	0.020K	0.125
	09 15	0005	17.3	5.3		277	8.70	138	0.060	0.300	0.020K	0.127
	09 15	0018	16.8	2.2		279	8.50	140	0.020K	0.400	0.020K	0.169
	09 15	0041	16.2	0.6		290	8.30	148	0.260	0.600	0.020K	0.257
75/10/07	09 30	0000	14.8	7.2	50	219	8.30	150	0.030	0.400	0.020K	0.132
	09 30	0005	14.8	6.8		221	8.35	149	0.040	0.500	0.020K	0.133
	09 30	0015	14.7	6.2		221	8.20	151	0.100	0.600	0.020K	0.152
	09 30	0040	14.5	5.0		221		150	0.060	1.200	0.020K	0.137

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT RFHNING PERCENT
75/05/06	13 20	0000	0.080		
	13 20	0040	0.092		
75/08/21	09 15	0000	0.187	2.2	
	09 15	0005	0.162		
	09 15	0018	0.203		
	09 15	0041	0.286		
75/10/07	09 30	0000	0.165	9.1	
	09 30	0005	0.165		
	09 30	0015	0.192		
	09 30	0040	0.477		

K VALUE KNOWN TO BE LESS THAN INDICATED

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350402
36 30 14.0 105 15 50.0 3
EAGLE NEST LAKE
35007 NEW MEXICO

101292

/TYPA/AMBNT/LAKE

11EPALES 04001002
0005 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/06	13 45	0000	6.5		36	317	8.20	157	0.020	0.700	0.020K	0.030
75/08/21	09 35	0000	16.1	3.0	16	277	8.40	139	0.160	0.500	0.020K	0.181
75/10/07	09 00	0000	13.8	6.8	12	211	7.55	140	0.040	0.800	0.020	0.086

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/06	13 45	0000	0.091	15.8	
75/08/21	09 35	0000	0.268	5.9	
75/10/07	09 00	0000	0.384	37.4	

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350403
36 32 03.0 105 15 17.0 3
EAGLE NEST LAKE
35007 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0024 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/08/21	08 45	0000	17.2	5.6	54	275	8.30	133	0.040	0.500	0.020K	0.111
	08 45	0005		5.3		275	8.60	134	0.050	0.400	0.020K	0.119
	08 45	0015	17.0	4.0		276	8.60	136	0.020K	0.300	0.020K	0.153
	08 45	0020	16.4	3.9		277	8.55	136	0.100	0.500	0.020K	0.157
75/10/07	09 15	0000	14.4	7.0	36	217	8.05	150	0.050	0.600	0.020K	0.124
	09 15	0005	14.5	6.4		219	8.20	149	0.040	0.800	0.020K	0.139
	09 15	0015	14.4	6.6		217	8.20	150	0.050	0.600	0.020K	0.141
	09 15	0025	14.2	6.2		215	8.25	150	0.050	0.400	0.020K	0.132

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/08/21	08 45	0000	0.151	3.9	
	08 45	0005	0.161		
	08 45	0015	0.158		
	08 45	0020	0.217		
75/10/07	09 15	0000	0.194	19.2	
	09 15	0005	0.182		
	09 15	0015	0.181		
	09 15	0025	0.160		

K VALUE KNOWN TO BE LESS THAN INDICATED

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APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3504A1
36 31 55.0 105 13 43.0 4
CIMARRON RIVER
35 15 UTE PARK
O/EAGLE NEST LAKE 101292
BNK BELO DAM 100 FT W OF TOLBY CRK RD
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	10	55	0.192	1.700	0.290	0.120	0.130
75/02/01	12	40	0.352	1.000	0.164	0.067	0.140
75/03/01	13	10	0.490	2.300	1.050	0.315	0.400
75/04/05	13	00	0.105	0.850	0.150	0.130	0.194
75/04/20	12	20	0.020	1.900	0.330	0.045	0.110
75/05/03	14	00	0.010	1.675	0.030	0.047	0.080
75/05/19	10	20	0.010	2.350	0.030	0.040	0.070
75/06/08	09	25	0.015	1.200	0.030	0.045	0.100
75/07/13	12	00	0.015	0.900	0.035	0.105	0.153
75/08/23	13	50	0.015	1.500	0.253	0.275	0.320
75/09/21	09	20	0.140	1.300	0.140	0.155	0.210
75/10/10	13	45	0.040	1.500	0.080	0.120	0.270
75/10/31	08	00	0.070	1.400	0.120	0.118	0.200

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

350481
36 33 12.0 105 16 05.0 4
MORENO CREEK
35 7.5 EAGLE NEST
T/EAGLE NEST LAKE 101292
RT 64 BRDG .3 MI W OF EAGLE NEST
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	11	25	0.016	1.000	0.035	0.015	0.040
75/03/01	13	45	0.005	0.650	0.105	0.085	0.100
75/04/05	13	24	0.065	4.300	0.060	0.030	0.930
75/04/20	14	50	0.125	2.300	0.065	0.020	0.230
75/05/03	14	30	0.020	2.000	0.075	0.025	0.100
75/05/19	10	10	0.010	3.000	0.045		0.160
75/06/08	09	45	0.005	0.750	0.015	0.015	0.070
75/07/13	13	05	0.005	1.400	0.020	0.010	0.110
75/08/23	14	40	0.005	0.300	0.025	0.010	0.040
75/09/21	09	45	0.010	0.350	0.015	0.010	0.010
75/10/10	14	15	0.005	0.700	0.020	0.010	0.020
75/10/31	08	50	0.005	0.300	0.005K	0.010	0.020

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3504C1
36 31 10.0 105 16 35.0 4
SIXMILE CREEK
35 7.5 EAGLE NEST
T/EAGLE NEST LAKE 101292
RT 64 BRDG 2.8 MI SSW OF EAGLE NEST
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	11	48	0.056	0.700	0.020	0.010	0.020
75/01/01	15	00	0.112	1.650	0.104	0.018	0.060
75/04/05	13	35	0.080	2.300	0.080	0.085	0.260
75/04/20	14	00	0.025	1.900	0.250	0.100	0.140
75/05/03	14	55	0.045	1.650	0.430	0.010	0.100
75/05/19	11	10	0.020	1.250	0.160	0.020	0.080
75/06/08	10	00	0.005	0.350	0.025	0.010	0.060
75/07/13	13	30	0.005	1.800	0.010	0.005	0.140
75/08/23	15	00	0.005	0.150	0.010	0.005K	0.030
75/09/21	10	15	0.010	0.300	0.005K	0.005K	0.010K
75/10/10	14	40	0.005	0.900	0.015	0.005	0.010K
75/10/31	09	15	0.015	1.300	0.055	0.005K	0.020

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

350401
36 29 15.0 105 15 54.0 4
CIENEGUILLA CREEK
35 7.5 PALO FEL PAS
T/EAGLE NEST LAKE 101292
DRT RD BRDG .6 MI E OF RT 64 JCT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	12	10	0.008	0.700	0.010	0.010	0.040
75/01/01	14	30	0.296	1.900	0.595	0.055	0.060
75/02/01	12	25	0.144	1.100	0.080	0.018	0.050
75/03/03	13	35	1.250	1.250	0.255	0.125	0.220
75/04/05	03	00	0.035	3.450	0.075	0.055	0.720
75/04/20	14	15	0.085	1.700	0.230	0.035	0.150
75/05/03	15	30	0.025	1.950	0.095	0.030	0.110
75/05/19	11	25	0.015	2.500	0.040	0.025	0.110
75/06/08	11	15	0.010	0.650	0.050	0.035	0.070
75/07/13	14	05	0.065	1.750	0.140	0.045	0.150
75/08/23	15	40	0.005	0.950	0.030	0.040	0.090
75/09/21	11	30	0.010	1.400	0.036	0.025	0.100
75/10/10	15	30	0.005	1.700	0.020	0.015	0.130
75/10/31	09	35	0.015	0.700	0.015	0.010	0.130

APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1975

STATE OF NEW MEXICO

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of New Mexico lakes sampled are presented to allow direct comparison of the ranking, by parameter, of each lake relative to the others. Median total phosphorus, median inorganic nitrogen and median dissolved orthophosphorus levels are expressed in mg/l. Chlorophyll *a* values are expressed in µg/l. To maintain consistent rank order with the preceding parameters, the mean Secchi disc depth, in inches, is subtracted from 500. Similarly, minimum dissolved oxygen values are subtracted from 15 to create table entries.

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
0812	NAVAJO RESERVOIR	0.025	0.130	420.928	2.164	11.200	0.009
3501	ALAMOGORDO	0.025	0.050	469.667	5.867	10.600	0.003
3502	BLUE WATER LAKE	0.036	0.140	480.125	3.867	11.400	0.012
3503	CONCHAS RESERVOIR	0.020	0.040	451.833	3.275	14.400	0.004
3504	EAGLE NEST LAKE	0.181	0.070	455.750	13.357	14.400	0.132
3505	ELEPHANT BUTTE RESERVOIR	0.083	0.110	475.750	6.758	14.200	0.052
3506	EL VADO RESERVOIR	0.034	0.140	466.444	2.189	12.600	0.014
3507	LAKE MACMILLAN	0.097	0.045	489.778	14.133	10.100	0.009
3509	UTE RESERVOIR	0.021	0.040	448.750	3.242	13.800	0.004

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
0812	NAVAJO RESERVOIR	63 (5)	25 (2)	100 (8)	100 (8)	75 (6)	56 (4)
3501	ALAMOGORDO	75 (6)	63 (5)	38 (3)	38 (3)	88 (7)	100 (8)
3502	BLUE WATER LAKE	38 (3)	6 (0)	13 (1)	50 (4)	63 (5)	38 (3)
3503	CONCHAS RESERVOIR	100 (8)	94 (7)	75 (6)	63 (5)	6 (0)	81 (6)
3504	EAGLE NEST LAKE	0 (0)	50 (4)	63 (5)	13 (1)	6 (0)	0 (0)
3505	ELEPHANT BUTTE RESERVOIR	25 (2)	38 (3)	25 (2)	25 (2)	25 (2)	13 (1)
3506	EL VADO RESERVOIR	50 (4)	6 (0)	50 (4)	88 (7)	50 (4)	25 (2)
3507	LAKE MACMILLAN	13 (1)	75 (6)	0 (0)	0 (0)	100 (8)	56 (4)
3509	UTE RESERVOIR	88 (7)	94 (7)	88 (7)	75 (6)	38 (3)	81 (6)